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The Association of Insurance Type with Costs of Dispensed Drugs

This study examines the association between types of prescription drug insurance coverage and the unit cost of dispensed drugs. Logistic regression and ordinary least squares regression were used to assess differences in the use of brand name and generic drugs and the unit cost of dispensed brand name or generic drugs across four insurance categories: Medicaid, private third party, indemnity, and uninsured. The results show that private third-party and indemnity prescriptions were more likely to be dispensed with brand name drugs. Also, indemnity patients and the uninsured were dispensed brand name and generic drugs with lower unit costs. The findings have ramifications for the design of prescription drug insurance benefits and suggest that physicians may respond to the economic situation of their patients when prescribing drugs.

Spending for prescription drugs in the United States increased from $12 billion in 1980 to $51.9 billion in 1994, roughly 23.8% annually (Levit et al. 1996). Growth in prescription drug expenditures consists of two components: an increase in the number of prescriptions dispensed, and/or an increase in the cost of the drug product per prescription dispensed. One factor likely associated with an increase in both components is the source of payment for drug expenditures. In 1980, 66% of prescription drug expenditures were paid in full, out of pocket by patients, and 34% were paid by third-party, private insurance and Medicaid service benefit programs (Genuardi, Stiller, and Trapnell 1996). In 1994, however, the share of prescription drug expenditures paid in full, out of pocket by patients decreased to 42%, and payments by third-party private insurance and Medicaid service benefit programs increased to 58% (Genuardi, Stiller, and Trapnell 1996). Patients paying in full, out of pocket include those covered by indemnity-type insurance and the uninsured. Service benefit programs typically require only a copayment or coinsurance out of pocket for each prescription dispensed.

In general, insurance coverage influences the choice of health care goods and services by reducing the cost to patients. Thus, insured patients, or physicians as agents of insured patients, may demand more or higher cost health care items (Newhouse 1978). To control increased demand for more or higher cost items, insurance plans implement patient cost-sharing provisions. The rationale for these cost-sharing provisions is that if the burden of patients' out-of-pocket spending at the time of consumption is large enough, insured patients and physicians may be induced to moderate their demand for more or higher cost items. Subsequently, there should be differences in the quantity and cost of health care items demanded by physicians or insured patients, since insurers potentially can use different cost-shar-

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ing provisions that result in varying out-of-pocket expenses among insured patients. The focus of this study is differences in cost of health care items, in particular, prescription drugs.

Pauly (1980) proposed that physicians, acting as patients' economic agents, will minimize costs in the selection of goods and services that require no physician time for production (i.e., prescription drugs) as a patient's out-of-pocket spending increases. Thus, the unit cost of goods and services requiring no physician time for production that are provided to patients should differ depending on the interrelated factors of patients' insurance status (insurance effect) and how much out of pocket patients are required to pay at the time of consumption (payment effect).

Prescription drugs are a useful example for examining how insurance and out-of-pocket expenditures influence the cost of health care goods and services for three reasons. First, payment for prescription drugs often involves out-of-pocket spending for patients at the time of dispensing even if they have prescription drug insurance coverage. Relative to other medical goods and services, prescription drugs comprise one-quarter of out-of-pocket medical expenditures for patients, making prescription drugs the single largest component of out-of-pocket costs (Sonnefeld et al. 1991).

Second, there is variability in the amount patients must pay out of pocket at the time of dispensing due to differences in the availability of prescription drug insurance coverage and in patients' out-of-pocket payment requirements across prescription drug insurance plans. Although more than 90% of the U.S. population employed in medium and large firms with health insurance coverage are offered some form of coverage for prescription drugs (Baker and Kramer 1991), many patients do not have coverage for prescription drugs due to employment in small firms, gaps in Medicare insurance, and unemployment. Out-of-pocket expenditures differ due to mechanisms such as coinsurance, copayments, and deductibles. Coinsurance rates for each prescription can range from 20% to 50% of the retail price, and copayments for prescriptions range from $.50 to $10 or more (Smith and Kirking 1992).

Third, controlling for illness, there is a high degree of variability in the use, number, and cost of prescription medicines available to treat individual disease states (American Society of Hospital Pharmacists 1993; Medical Economics Company 1993). Temin (1991) showed that utilization rates of 14 antibiotics ranged from less than 1% to 38% across nine disease states where antibiotic use might be warranted. Factors contributing to the number of drug products available are research efforts of the pharmaceutical industry and the availability of generic drug products. Differences in cost of drug products depend on whether a drug is a brand name or generic product, the age of the product, and the number of similar drugs available (Stateman and Tyebjee 1981; Pongcharoensuk 1989; Frank and Salkever 1991). Overall, the variability in use, number, and cost of drug products combined with different patient out-of-pocket amounts for prescription drugs suggest differences in the type (e.g., brand or generic) and cost of drug products used across insurance types.

Several studies have examined the influence of insurance coverage and patient out-of-pocket expenditures on the use of prescription drugs (Martin and Williams 1959; Greenlick and Darsky 1968; Weeks 1973; Smith and Garner 1974; Nelson, Reeder, and Dickson 1984; Leibowitz, Manning, and Newhouse 1985; Lavers 1989; Harris, Stergachis, and Reid 1990; Kotzan and Carroll 1991; Holcombe and Griffin 1993; Smith 1993; Gianfrancesco, Baines, and Richards 1994). Two studies (Kotzan and Carroll 1991; Holcombe and Griffin 1993) showed that as insured patients paid less out of pocket for prescription drugs they used drugs which were higher in unit cost. Past research examining the association of insurance type with brand and generic drug use is equivocal (Leibowitz, Manning, and Newhouse 1985; Kotzan and Carroll 1991). The weaknesses of previous studies are that they examined only a few therapeutic categories of dispensed drugs or limited types of insurance coverage for prescription drugs, thus limiting the generalizability of effects of insurance plan and patient payment on the cost of dispensed drugs.

The purpose of this study is to determine whether the unit cost of dispensed drugs is associated with types of insurance coverage that require patients to pay different amounts out of pocket at the time of dispensing. We examined the association of insurance type with brand name and generic drug use and the relationship of insurance type with the unit cost of dispensed brand name and generic drug products. We looked at these associations across all therapeutic categories of dispensed drugs and all groups of prescription drug users. Because the insurance effect and payment effect are intertwined, we consider both in the analysis.

Methods

Empirical Models

Since it is likely that insurance type influences whether a brand name or generic drug is dispensed, and subsequently the unit cost of the dispensed drug, we developed an approach to examine how insurance type is associated with both the use and unit cost of brand name and generic drug products. We conceptualized and modeled the selection of dispensed drugs as a two-step process. In the first step, the physician, patient, and/or pharmacist determines whether a brand name or generic drug is to be dispensed. Insurance type can influence the selection of a brand name or generic drug product in two ways. First, the use of generic drug products may be promoted by prescription drug cost control mechanisms implemented by insurers, such as formularies, mandatory generic substitution, and higher dispensing fees paid to pharmacies for generic drug products. Second, the amount of out-of-pocket spending required of a patient may sensitize that patient to the cost of dispensed drugs, encouraging the use of a less expensive product. We modeled the first step of the process by examining the probability of brand name or generic drug use across insurance types, controlling for therapeutic category and dispensing pharmacy.

In the second step, which is conditional on the decision to use a brand name or generic drug product, the unit cost of dispensed drug may vary depending on which drug product is selected. We modeled this step by comparing the unit cost of brand name and generic drug products separately across insurance types, controlling for therapeutic category and dispensing pharmacy.

Study Design and Data Collection

We used a cross-sectional, field study descriptive design for collecting and analyzing data. The data were collected through audits of new prescription orders dispensed from a judgment sample of 10 independently owned community pharmacies in a midwestern state. Following a data cross-classification method to determine sample size, we audited a systematic random sample of 612 new prescription orders dispensed at each pharmacy between October 1, 1993, and September 30, 1994, producing a study sample of 6,120 new prescription orders.

Variables

The dependent variables were whether the drug dispensed was a brand name or generic drug product and the unit cost of dispensed drug. Unit cost was defined as the cost per dose (e.g., tablet, capsule, teaspoonful).[1] Unit cost of dispensed drug was estimated using reference pricing lists and government program payment levels for drugs. For brand name drug products, we based cost on the average wholesale price (AWP) listed in the Red Book® for the month and year in which the prescription was written. For generic drug products, cost was the state upper limit for pharmacy reimbursement (historically the maximum allowable cost [MAC]) based on the Health Care Financing Administration (HCFA) Federal Financial Participation Upper Limit (FFP-UL) amounts. For generic products without an FFP-UL price, cost was the average of AWP for those drug products listed in the Red Book®. We used AWP and FFP-UL because they are estimates of cost to the pharmacy of drug products, and thus are an indicator of the relative cost of drug products. Using AWP and FFP-UL also provides a means for comparing dispensed drugs on a cost basis without market influences (i.e., pharmacy mark-up, various pharmacy reimbursement schedules from insurers). Prescription orders for topical products and devices (e.g., diabetic supplies, inhalation spacer devices) were not audited.

The first independent variable was type of prescription drug insurance coverage. We categorized prescription drug insurance coverage into four types—Medicaid, private third party, indemnity and uninsured—based on the methods and payment amounts patients encountered when obtaining prescriptions at a pharmacy. Medicaid and private third-party insurance represented service benefit prescription drug coverage requiring patients to pay either coinsurance or copayment amounts for prescription drugs. Medicaid copayments across the nation are either nothing or low amounts (usually $1 or less) (Colligen 1994). Private third-party copayments or coinsurance rates produce higher out-of-pocket expenditures relative to Medicaid, but are considerably lower than the average retail price of a prescription (copayments typically are less than $10 per prescription compared to approximately $30 average prescription charge in community pharmacies) (Hargis 1994).

Indemnity and uninsured categories represented patient insurance status where the patient pays the

full retail price at the time of dispensing. Indemnity-insured patients submit a claim for prescriptions and typically are reimbursed a percentage of the retail price after meeting a deductible. The ultimate cost to the patient is the time value of money delayed in the payment-reimbursement cycle, and the percentage of the retail price not reimbursed. Thus, although private third-party and indemnity patients have insurance coverage, they differ in what they pay out of pocket at the time of dispensing. Uninsured patients have no indemnifying or service benefit insurance mechanism to recover or reduce prescription expenses. Data concerning type of prescription drug insurance coverage and patient out-of-pocket expenditures were collected from information recorded on the new prescription orders that were audited or provided by the dispensing pharmacists.

We controlled for dispensing pharmacy and therapeutic category of dispensed drug. Controlling for dispensing pharmacy was necessary since brand/generic use and unit costs may differ across pharmacies due to physician prescribing patterns, case mix of illnesses, or actions of pharmacists (Goldberg et al. 1979; Yeasalis et al. 1980; Vuturo, Krisher, and McCormick 1980; Stewart, Grussing, and Purohit 1982; Shepherd, Pongcharoensuk, and Kreling 1986; Stergachis et al. 1987; Forstrom, Reid, and Stergachis 1990; Knowlton and Knapp 1994). Therapeutic category was controlled since the availability of brand and generic drug products and unit costs differ across therapeutic category (Medical Economics Company 1993). Our division of dispensed drugs into therapeutic categories was based on categories used in past research (Vernon 1971; Cocks and Virts 1974; Hornbrook 1976). We based therapeutic category of the dispensed drug on information collected from the new prescriptions audited.

Data Analysis

Using logistic regression analysis, the first step of the model examined the association of insurance type, dispensing pharmacy, and therapeutic category with the probability of a prescription being dispensed with a brand name or generic drug product. The dependent variable was a dummy variable for brand name drug dispensed (=1) or generic drug dispensed (=0) collected from each prescription audited. The statistical significance of parameters was assessed using −2 log likelihood. Contrasts between estimated logistic regression coefficients for the insurance type variables were performed to test for differences in the probability of having a brand name or generic drug dispensed.

The second step of the process examined the association of insurance type with mean unit cost of dispensed brand name and generic drug products using two separate ordinary least squares (OLS) regression models, one for prescriptions dispensed with brand name drug products and the other for prescriptions dispensed with generic drug products. Contrasts between estimated regression coefficients for the insurance type variables from each regression model were performed to test for differences in the mean unit cost of brand name and generic drugs. For all contrasts, the test statistic was computed by dividing the difference between the estimated regression coefficients being tested by the standard error of the difference (Hays 1988). The test statistic was t-distributed and hypothesis tests were two-tailed and tested at a significance level of .025 because there were multiple contrasts (Keppel 1982).

Results

The study pharmacies were located in rural, small urban, and urban areas. Annual new prescription volume in these pharmacies ranged from 6,329 prescriptions to 31,331 prescriptions; the average annual new prescription volume was 14,751 prescriptions. Nationally, in 1993, the average annual new prescription volume in independently owned community pharmacies was 16,207 prescriptions (Schondelmeyer and Johnson 1994).

The largest number of prescriptions was in the private third-party insurance type (Table 1). In 1993, it was estimated that 30.5% of prescriptions dispensed from independent community pharmacies in the United States were private third-party insurance, 24.3% were Medicaid, 15.1% were indemnity, and 30.1% were uninsured (Schondelmeyer and Johnson 1994; Kreling and Paulsen 1989). The sample distribution of prescriptions into insurance types was different from the estimated national distribution of prescriptions ($\chi^2 = 358.95$, $p < .05$). The differences likely are due to the study sample including only 10 pharmacies in one state and auditing only new prescriptions, whereas national estimates were based on new and refill prescriptions.

The average patient out-of-pocket expenditure for Medicaid, private third-party, indemnity and uninsured prescriptions was $.70, $5.87, $31.18, and $24.36, respectively (Table 1). There were differences in mean cost per dose of dispensed drug across insurance types with uninsured prescriptions having

the lowest mean cost per dose ($.60) and private third-party prescriptions having the highest mean cost per dose ($.83). The five most common therapeutic categories were: anti-infective (n = 2,031, 33.2%), cardiovascular (n = 647, 10.6%), analgesic (n = 502, 8.2%), antipsychotic/anticonvulsant (n = 413, 6.7%) and anti-inflammatory (n = 357, 5.8%). The remaining 22 therapeutic categories represented 35.5% of the prescriptions. Analysis of phi coefficients for the independent variables showed no correlation greater than .31.

Table 2 summarizes the results of logistic regression analysis for the probability of a prescription being dispensed with a brand name drug product. The table contains odds ratios for insurance type, dispensing pharmacy, and therapeutic category variables. Contrasts for odds ratios for the insurance type variables also are contained in the table. The insurance type variables were dummy coded and uninsured was the excluded insurance type in the logistic regression model. Therefore, the odds ratios for the insurance type variables are interpreted relative to uninsured prescriptions. The results show that private third-party prescriptions were 1.56 and 1.71 times more likely to be dispensed with brand name drugs relative to Medicaid and uninsured prescriptions, respectively. Indemnity prescriptions were 1.51 and 1.39 times more likely to be dispensed with brand name drug products relative to uninsured and Medicaid prescriptions, respectively.

Table 3 contains descriptive analyses of brand name and generic prescriptions in the sample of new prescription orders. The table highlights differences in patient payment requirements across insurance types for brand name and generic prescriptions. It also shows differences in proportions of brand name and generic prescriptions dispensed for the different insurance types. Medicaid and uninsured prescriptions had the highest generic dispensing rates.

Patient payment amounts for brand name and generic Medicaid prescriptions were equal, which is consistent with the study state's Medicaid policy of not requiring differential copayments for brand name and generic drug products. On average, patient out-of-pocket payment (copayment/coinsurance) for brand name, private third-party prescriptions was $2.82 more than for generic private third- party prescriptions. This relatively small dollar differential may contribute to the increased likelihood of private third-party prescriptions being dispensed with brand name drug products. Patients may be willing to pay the additional dollar amount for a perceived higher quality brand name drug product to prevent dispensing of a generic equivalent or a therapeutically similar brand name drug product. Also, mean out-of-pocket expenditure for brand name indemnity prescriptions was greater than uninsured prescriptions, even though the mean unit cost per dose for brand name indemnity prescriptions was $.14 less than uninsured prescriptions. This may suggest increased quantity per prescription. Alternatively, since research has shown pharmacy profit margins to be lower for private third-party prescriptions (Carroll, Miederhoff, and Waters 1996), the price for indemnity prescriptions may be inflated to compensate for losses from other insurance types.

Table 4 summarizes ordinary least squares regression analyses of the unit cost of brand name drug products and generic drug products. Estimated regression coefficients for insurance type, dispensing pharmacy, and therapeutic category variables as well as contrasts between estimated regression coefficients for the insurance type variables are contained in the table. Since the distribution of the dependent

Table 1. Summary information for sample of new prescription orders (N = 6,120)

Insurance type	Number of prescriptions	Percentage of prescriptions	Mean out-of-pocket expenditure ($)	Mean cost per dose ($)
Medicaid	1,151	18.8	.70	.60
			(.77)	(.95)
Private third party	2,519	41.2	8.67	.83
			(5.43)	(1.14)
Indemnity	926	15.1	31.18	.68
			(30.13)	(.91)
Uninsured	1,524	24.9	24.36	.60
			(26.69)	(1.19)
Total	6,120	100.0	13.33	.72
			(23.40)	(1.09)

Note: Standard deviations are in parentheses.

Table 2. Logistic regression results: effects of independent variables on prescriptions dispensed with a brand name or generic drug product (N = 6,120)

Variable	Odds ratio of brand name drug use
Constant	3.86 (.41, 36.14)
Insurance type[a]	
Uninsured	excluded
Medicaid	1.09 (.80, 1.34)[b]
Private third party	1.71** (1.44, 2.01)
Indemnity	1.51** (1.21, 1.88)
Dispensing pharmacy[c]	
Pharmacy 1	excluded
Pharmacy 2	2.01* (1.55, 2.59)[d]
Pharmacy 3	2.33* (1.81, 3.01)
Pharmacy 4	1.34* (1.03, 1.72)
Pharmacy 5	1.10 (.85, 1.43)
Pharmacy 6	1.61* (1.28, 2.08)
Pharmacy 7	1.48* (1.14, 1.92)
Pharmacy 8	1.71* (1.31, 2.24)
Pharmacy 9	2.30* (1.77, 2.99)
Pharmacy 10	1.66* (1.28, 2.15)
Therapeutic category[e]	
Anti-infective	excluded
Cough and cold	2.78* (2.12, 3.65)[d]
Gastrointestinal	9.65* (6.99, 13.32)
Analgesic	.72* (.58, .91)
Anti-inflammatory	1.37* (1.09, 1.74)
Muscle relaxant	1.22 (.76, 1.94)
Dental	1.031 (.02, >1,051)
Anti-alcoholic	.01 (<.01, >100)
Oral contraceptive	26.1* (11.24, 60.6)
Cardiovascular	3.27* (2.71, 3.95)
Antilipidemic	11.9* (5.57, 25.48)
Allergy	7.77* (5.73, 10.53)
Hormone	12.5* (8.31, 18.75)
Asthma	14.7* (9.03, 23.92)
Antidepressant	2.21* (1.72, 2.83)
Antipsychotic/anticonvulsant	1.96* (1.56, 2.46)
Antineoplastic	1.069 (.01, >1,069)
Vitamin	1.60 (.96, 2.69)
Diabetes	15.9* (6.19, 40.88)
Anti-gout	.19 (.02, 1.44)
Anti-migraine	4.64* (1.36, 15.87)
Blood modifier	1,139 (.32, >1,159)
Anti-incontinence	.18 (.02, 1.43)
Anti-smoking	1,216 (.01, >1,216)
Sedative/hypnotic	1.44* (1.10, 1.89)
Skin	921 (.01, >921)
Prostate	726 (.01, >726)
Insurance-type contrasts	**Odds ratio difference[f]**
Private third party – Medicaid	1.56** (1.28, 1.92)
Indemnity – Medicaid	1.39** (1.09, 1.75)
Private third party – Indemnity	1.13 (.93, 1.37)

Note: All variables are dummy coded, = 1 if they possess the characteristics, and = 0 otherwise. Confidence intervals are in parentheses.
[a] –2 log likelihood = 55.4, 3 df, $p < .001$.
[b] 97.5% confidence interval due to multiple contrasts.
[c] –2 log likelihood = 87.8, 9 df, $p < .001$.
[d] 95% confidence interval.
[e] –2 log likelihood = 1,104.3, 27 df, $p < .001$.
[f] Significant at $p < .05$, two-tailed.
** Significant at $p < .025$ (due to multiple contrasts), two-tailed.

variable (cost per dose) was positively skewed, cost per dose was transformed with the natural logarithm transformation (Mirer 1988). Thus, estimated regression coefficients for the insurance type variables are interpreted as percentage differences in mean unit cost relative to uninsured prescriptions.

The mean cost per dose for dispensed brand name drugs was significantly higher for private third-party and Medicaid prescriptions (20.2% and 13.9% higher, respectively) than for uninsured prescriptions. Contrasts between estimated regression coefficients for the insurance type variables showed that private third-party prescriptions had a mean cost per dose significantly higher (17.4%) than indemnity prescriptions. For generic drug products, private third-party and Medicaid prescriptions had significantly higher mean cost per dose (14.6% and 12.2% higher, respectively) than uninsured prescriptions. Contrasts between estimated regression coefficients for the insurance type variables showed no statistically significant differences in mean cost per dose of dispensed generic drugs.

Discussion

The focus of this study was to determine the association between types of prescription drug insurance that require patients to pay varying out-of-pocket amounts and the unit cost of dispensed drug by examining use and unit costs of brand name and generic drug products. Results show there are differences in brand/generic drug utilization rates across insurance types, as well as differences in unit cost of brand name and generic drug products.

The variation in unit costs of dispensed drug among the four insurance types controlling for dispensing pharmacy and therapeutic category is consistent with past research. Kotzan and Carroll (1991) found that total prescription drug costs for Medicaid patients for antiarthritic medications and vasodilator dosage forms were 15.4% and 29.2% higher, respectively, than private payment (non-third-party) patients. Holcombe and Griffin (1993) reported that Medicaid patients were significantly more likely to receive higher cost pain medications than uninsured patients. We found the mean cost per dose of dispensed brand name drugs for Medicaid prescriptions to be 11.1% and 13.9% higher than indemnity and uninsured prescriptions, respectively. The mean cost per dose of dispensed generic drugs for Medicaid prescriptions was 5.8% and 12.2% higher than indemnity and uninsured prescriptions, respectively. The difference between Medicaid and uninsured

prescriptions was statistically significant for both brand name and generic dispensed drugs.

The advantage in comparing all four of the insurance types simultaneously is that we could assess the relative strength of the insurance effect (having coverage for prescription drugs) and the patient payment effect (the amount paid out of pocket). The insurance effect is seen by comparing the indemnity group with the uninsured group. Both groups pay full retail price for drugs, yet they differ by insurance status (indemnity patients have insurance coverage that reimburses them at least some of the initial out-of-pocket expense).

Overall, our analyses show that indemnity prescriptions had a higher mean unit cost of dispensed drug ($.68) than uninsured prescriptions ($.60). Much of the difference was due to the likelihood that indemnity prescriptions would be dispensed with brand name drug products, because the mean unit costs of brand name and generic drug products dispensed for indemnity prescriptions did not differ significantly from the mean unit cost for uninsured prescriptions. Patients, physicians, and/or pharmacists may respond to the presence of insurance by increasing the use of brand name drug products (possibly perceived as higher quality relative to generic drug products), but respond to the burden of out-of-pocket spending by using relatively low-cost brand name drug products.

The effect of payment type is seen by comparing the private third-party and indemnity groups. These groups both have insurance coverage yet differ in the amount of out-of-pocket payment at the time of dispensing. Overall, mean unit cost of dispensed drug for private third-party prescriptions ($.83) was higher than indemnity prescriptions ($.68). Although the odds of private third-party and indemnity prescriptions being dispensed with brand name drugs was similar, private third-party prescriptions for brand name drugs were dispensed with significantly higher-cost brand name drugs. Thus, the relatively small out-of-pocket expense for patients with private third-party insurance may have prompted physicians, patients, and/or pharmacists to use higher-cost brand name drug products relative to indemnity insurance highlighting the impact of relatively larger patient out-of-pocket expenditures.

Another explanation for the difference in unit cost of brand name drugs between private third-party and indemnity prescriptions is the self-selection of patients into private third-party plans. Patients who are high users of prescription drugs or use high-cost prescription drugs may self-select into private third-party plans because the out-of-pocket costs at the

Table 3. Summary information for brand name and generic prescriptions in the sample of new prescription orders

Insurance type	Number of prescriptions	Percentage of insurance type prescriptions	Mean out-of-pocket expenditure ($)	Mean cost per dose ($)
Prescriptions dispensed with brand name drug products (N = 3,809)				
Medicaid	517	44.9	.70	1.34
			(.71)	(1.10)
Private third party	1,347	53.5	7.38	1.36
			(6.47)	(1.32)
Indemnity	503	54.3	42.61	1.08
			(34.17)	(1.03)
Uninsured	642	42.1	39.23	1.22
			(33.20)	(1.63)
Total	3,009	49.2	19.00	1.29
			(27.52)	(1.32)
Prescriptions dispensed with generic drug products (N = 3,111)				
Medicaid	634	55.1	.70	.16
			(.81)	(.21)
Private third party	1,172	46.5	4.36	.22
			(3.31)	(.33)
Indemnity	423	45.7	16.40	.21
			(14.03)	(.46)
Uninsured	882	57.9	13.53	.15
			(12.27)	(.29)
Total	3,111	50.8	7.85	.18
			(10.58)	(.29)

Note: Standard deviations are in parentheses.

Table 4. Ordinary least squares regression results: effects of independent variables on ln(cost/dose) for brand name (N = 3,089) and generic (N = 3,111) drug products

Variable	Brand name drugs Estimated coefficient	Generic drugs Estimated coefficient
Constant	.559* (.060)	−2.05* (.062)
Insurance type		
Uninsured	excluded	excluded
Medicaid	.139** (.045)	.122** (.052)
Private third party	.202** (.036)	.146** (.043)
Indemnity	.028 (.044)	.064 (.059)
Dispensing pharmacy		
Pharmacy 1	excluded	excluded
Pharmacy 2	−.034 (.060)	−.115 (.078)
Pharmacy 3	−.076 (.060)	.093 (.078)
Pharmacy 4	−.088 (.061)	−.139 (.074)
Pharmacy 5	−.087 (.066)	.029 (.078)
Pharmacy 6	−.109 (.061)	−.154* (.076)
Pharmacy 7	−.142* (.062)	−.094 (.075)
Pharmacy 8	.083 (.065)	−.231* (.079)
Pharmacy 9	−.036 (.064)	−.130 (.077)
Pharmacy 10	.067 (.063)	−.185* (.075)
Therapeutic category		
Anti-infective	excluded	excluded
Cough and cold	−1.28* (.065)	−.516* (.097)
Gastrointestinal	−.363* (.055)	−.274* (.135)
Analgesic	−.977* (.059)	−.136* (.056)
Anti-inflammatory	−.759* (.066)	−.108 (.070)
Muscle relaxant	−.702* (.131)	.681* (.139)
Dental	−.935* (.186)	—
Anti-alcoholic	−.861 (.509)	−.625 (.943)
Oral contraceptive	−.935* (.091)	1.09* (.286)
Cardiovascular	−1.10* (.046)	−.531* (.065)
Antilipidemic	−.015 (.107)	1.87* (.334)
Allergy	−1.31* (.056)	−.649* (.125)
Hormone	−1.72* (.060)	.571* (.178)
Asthma	−2.43* (.066)	.317 (.208)
Antidepressant	−.364* (.055)	−.657* (.082)
Antipsychotic/anticonvulsant	−1.06* (.060)	−.288* (.073)
Antineoplastic	−.205 (.240)	—
Vitamin	−2.22* (.143)	−1.35* (.156)
Diabetes	−1.38* (.116)	−.238 (.422)
Anti-gout	−2.86* (.715)	−.757* (.270)
Anti-migraine	−1.20* (.254)	.719 (.473)
Blood modifier	−1.25* (.138)	—
Anti-incontinence	−1.58* (.714)	−.062 (.286)
Anti-smoking	.446* (.217)	−.462 (.944)
Sedative/hypnotic	−.952* (.076)	−.884* (.081)
Skin	−.270 (.227)	—
Prostate	.046 (.715)	—
	R^2 = .478 F = 71.65*	R^2 = .139 F = 15.07*

Insurance-type Contrasts	Difference	Insurance-type Contrasts	Difference
Private third party − Medicaid	.063 (.043)	Private third party − Medicaid	.024 (.054)
Indemnity − Medicaid	−.111 (.050)	Indemnity − Medicaid	−.058 (.066)
Private third party − Indemnity	.174** (.053)	Private third party − Indemnity	.082 (.055)

Note: All variables are dummy coded, = 1 if they possess the characteristic, and = 0 otherwise. Standard errors are in parentheses.

* Significant at $p < .05$, two tailed.

** Significant at $p < .025$ (due to multiple contrasts), two tailed.

time of dispensing are low, thus improving their access to higher-cost drugs they need. However, since enrollment in private third-party prescription drug insurance plans is a component of the health benefit offered to employees, patient self-selection from uninsured to indemnity may be more likely to occur. We could not address the influence of patient self-selection in this study.

Our results suggest increasing cost-sharing amounts. For example, employing coinsurance provisions to link resource use with out-of-pocket expenditures, or changing the type of benefit (i.e., switching to an indemnity plan) may be an effective means of managing drug costs by allowing a market mechanism, namely prescription price, to manage costs. However, it is possible that increasing cost-sharing amounts to manage drug costs may be a shortsighted strategy due to the impact drug use can have on spending for other health care resources. Improved access to a more expensive drug product may result in better disease control, quicker recovery, or fewer drug interactions, thus decreasing the probability of a hospital admission, additional physician visits, or use of other health care system resources. Research has shown that increased cost sharing for all health care goods and services resulted in poorer clinical outcomes among low-income hypertensive patients (Newhouse 1993). Also, when access to prescription drugs was reduced for Medicaid patients, poorer health outcomes resulted (Lurie et al. 1984; Lurie et al. 1986) and overall Medicaid costs increased (Soumerai et al. 1991; Soumerai et al. 1994). Thus, increasing out-of-pocket spending may be a concern for low-income individuals and publicly funded programs (i.e., Medicaid). A concern for policymakers is whether the use of higher-cost prescription drugs in the Medicaid and private third-party groups, for example, results in lower overall health care costs for these groups.

No research known to the authors has examined the impact of substantially increasing patient out-of-pocket spending for prescription drugs by switching from service benefit coverage (private third party) to indemnity insurance or eliminating drug coverage. Future research could examine changes in use and cost of prescription drugs, as well as overall health care costs before and after such a switch. It also would be useful to study how patients' behaviors change when they are required to pay substantially more out of pocket for prescription drugs. Specifically, research could examine patients' information-seeking behaviors regarding alternative, less expensive drug therapies or how to use their drug therapy more effectively. These behaviors may not only reduce drug costs, but they may improve overall health outcomes by promoting more effective use of drug therapy.

We found that uninsured and Medicaid prescriptions were more likely to be dispensed with generic drugs relative to private third-party and indemnity prescriptions. These results differ from past research examining use of brand and generic drug products across insurance types. Leibowitz, Manning, and Newhouse (1985) found no difference in generic drug use as insured patients paid more out of pocket for prescription drugs in the Health Insurance Experiment. Kotzan and Carroll (1991) found that generic drug use was higher as insured patients paid more out of pocket for antiarthritic prescription drugs. However, our results do agree with past research examining use of other health care services which suggests the uninsured are less likely to receive certain types of procedures (especially those that are more costly and more discretionary) (Sloan, Valvona, and Mullner 1986; Hadley, Steinberg, and Feder 1991; Mort et al. 1996).

Differences between previous work and our results concerning the likelihood of brand/generic drug use across insurance types, coupled with the unit cost results, may reflect a change in the availability of generic drugs, a change in physicians' awareness of drug costs, or a change in physicians' knowledge of their patients' prescription drug insurance type. Generic drugs are very common and their dispensing is promoted by administrators of service benefit prescription drug plans (private third party and Medicaid) through use of mandatory generic drug substitution, prescribing protocols, and different dispensing fees for brand and generic drugs (Kreling and Mucha 1992). The suggestion that physicians are more knowledgeable of drug costs is contrary to past research (Kaine and O'Connell 1972; Lowy, Lowy, and Warner 1972; Roth 1973; Fink and Kerrigan 1978; Nagurney, Braham, and Reader 1979; Oppenheim, Erickson, and Ashworth 1981; Kolassa 1995), but is an area for future study. Although the explanation that physicians may be more aware of their patients' insurance status agrees with past research (Mort et al. 1996), little is known about physicians' knowledge of their patients' prescription drug insurance status. Of particular interest is whether physicians ask patients about their prescription drug insurance status and alter their prescribing according to insurance type. Anecdotally, we know this occurs.

Our results suggest that the Medicaid program is

more effective than private third-party programs at increasing generic drug use. Providers may be more aware of the mechanisms used by the Medicaid program, since Medicaid programs were the first to implement these requirements (e.g., maximum allowable cost (MAC) programs) (Gagnon and Jang 1979) or are more willing to comply with the requirements due to public funding of the Medicaid program. Additionally, the relatively small increase in out-of-pocket spending for brand name drugs compared to generic drugs for private third-party prescriptions may dissuade patients from having prescriptions dispensed with generic drug products.

The higher cost of generic drugs for Medicaid and private third-party prescriptions may be an indicator of the ability to promote generic drug use. When a brand name drug product loses its patent, the first generic version to enter the market is priced at or near the brand name price. As other generic versions enter the market, the unit price drops (Jambulingam and Kreling 1995). Thus, the relatively high unit cost for generic drug products for Medicaid and private third-party prescriptions may reflect the influence of mandatory generic substitution policies associated with Medicaid and private third-party prescription drug insurance that are implemented rapidly after brand name drug patent expirations.

Patients' relatively low out-of-pocket expense for prescription drugs may influence physician behavior and influence patient demand for prescription drugs (Raynes 1979; Cockburn, Reid, and Sanson-Fisher 1987; Schwartz, Soumerai, and Avorn 1989; Sleath 1993). Information related to patient demand for prescription drugs is useful since patient demand may undermine cost containment efforts employed by insurers (e.g., formularies and different copayment amounts for brand and generic drug products). Future research could examine why patients required to pay copayments for prescription drugs obtain higher-cost drugs. One possible explanation is that patients demand them, because they have improved access to these drugs and do not face the product's full price. Or it could be the increased direct-to-consumer advertising of prescription drugs by the pharmaceutical industry, or that patients are less willing to try lower-cost alternatives. Previous research has shown that generic substitution rates differ across prescription drug insurance types. Approximately 51% of private third-party prescriptions were substituted generically compared to 66% for Medicaid, 57% for uninsured, and 49.5% for indemnity prescriptions. These results provide some evidence that patients with private third-party insurance may not be willing to use lower-cost drug products (Mott and Kreling 1997).

Limitations

Some limitations of our study should be noted. Data were collected from only 10 pharmacies and chain pharmacies were not represented in the sample. Both these factors limit the generalizability of the results. However, a key question concerning chain pharmacies is whether different drug products are dispensed in chain pharmacies relative to independently owned pharmacies, given patient prescription drug insurance type.

The explanation for the association of unit costs of dispensed drugs with insurance types was based on economic incentives. However, differences in the cost of products used among the insurance types also may be due to differences in patient demographic variables, severity of disease, number of patient comorbidities, and case-mix differences within therapeutic categories (Greenlick and Darsky 1968; Garner 1970; Weeks 1973; Stuart et al. 1991; Smith 1993). A problem for researchers who wish to examine the influence of these variables on drug cost or utilization across potentially all users of drugs is the availability of data. Although various databases from insurers likely contain most of the information needed, claims data for the uninsured are difficult to obtain. We obtained drug data and patient information (i.e., insurance status) at the pharmacy level. The availability and validity of patient-specific data from pharmacies and pharmacists are areas for future research. Alternate data sources may be needed to link drug use data, patient demographics, and other patient care variables.

Pharmacists at each pharmacy were asked to provide insurance information for patients to the best of their knowledge, thus some prescriptions may be classified into the wrong insurance type. It was believed this was more of a problem for the uninsured and indemnity insurance types. Patients with indemnity insurance likely submitted claims to their insurance company without the help of a pharmacist, thus the pharmacists may not have known with certainty all patients with indemnity insurance. Subsequently, prescriptions classified as uninsured actually may have been indemnity insurance. Based on the results of the study, such misclassification may have inflated the unit cost of dispensed drug for uninsured prescriptions and understated the unit cost of dispensed drug for indemnity prescriptions. The converse also is possible.

Conclusions

The intent of this study was to address two weaknesses of the literature examining the association of the unit cost of dispensed drugs with insurance type and patient out-of-pocket spending. We examined the unit cost of dispensed drugs for all therapeutic categories. Also, by collecting drug use data at the pharmacy level, we were able to examine the unit cost of dispensed drugs across potentially all prescription drug insurance types (and patient payment levels) including uninsured patients. Our findings suggest that as patients' out-of-pocket expenses for prescription drugs exceed copayment amounts, they are dispensed drugs (both brand name and generic) with lower unit costs, controlling for dispensing pharmacy and therapeutic category of the dispensed drug. The results agree with the rationale for using cost-sharing provisions and also agree with implications of Pauly's (1980) economic model of the patient-physician agency relationship that physicians may act as economic agents of their patients when selecting drug therapy.

The main policy ramification of the results is that increasing cost-sharing amounts or changing the type of prescription drug benefit may result in lower prescription drug costs for insurers due to the use of lower-cost drug products. However, this policy may apply only to select patient populations as increased cost sharing may decrease access to prescription drugs. Additionally, the policy recommendation is balanced by whether the use of higher-cost prescription drugs results in better long-term health outcomes and reduced health care expenditures.

Notes

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1 Unit cost of prescribed drug also was defined as the cost per day of prescribed drug determined from the directions on the face of each audited prescription. We used cost per dose since the results of models using cost per day as the dependent variable were similar.

References

American Society of Hospital Pharmacists. 1993. *AHFS Drug Information 94*. Bethesda, Md.: American Society of Hospital Pharmacists.

Baker, C., and N. Kramer. 1991. Employer Sponsored Prescription Drug Benefits. *Monthly Labor Review* 114: 31–35.

Carroll, N. V., P. A. Miederhoff, and L. W. Waters. 1996. Profitability, Third-Party Reimbursement, and Access to Community Pharmacies. *Clinical Therapeutics* 18(4):703–715.

Cockburn, J., A. L. Reid, and R. W. Sanson-Fisher. 1987. The Process and Content of General-Practice Consultations That Involve Prescription of Antibiotic Agents. *Medical Journal of Australia* 147:321–324.

Cocks, D., and J. Virts. 1974. Pricing Behavior in the Ethical Pharmaceutical Industry. *Journal of Business* 47:349–362.

Colligen, B. H., ed. 1994. *Pharmaceutical Benefits Under State Medical Assistance Programs*. Reston, Va.: National Pharmaceutical Council.

Fink, J. L., and D. J. Kerrigan. 1978. Physicians' Knowledge of Drug Prices. *Contemporary Pharmacy Practice* 1(1): 18–21.

Forstrom, M. J., D. Reid, and A. S. Stergachis. 1990. Effect of a Clinical Pharmacist Program on the Cost of Hypertension Treatment in an HMO Family Practice Clinic. *DICP, Annals of Pharmacotherapy* 24:304–309.

Frank, R. G., and D. S. Salkever. 1991. *Pricing, Patent Loss and the Market for Pharmaceuticals*. Working paper no. 3803. Cambridge, Mass.: National Bureau of Economic Research.

Gagnon, J. P., and R. Jang. 1979. *Federal Control of Pharmaceutical Costs: The MAC Experience*. Nutley, N.J.: Roche Laboratories.

Garner, D. D. 1970. A Study of Drug Utilization Patterns Through Prescription Analysis. Doctoral dissertation. University of Mississippi.

Genuardi, J. S., J. M. Stiller, and G. R. Trapnell. 1996. Changing Prescription Drug Sector: New Expenditure Methodologies. *Health Care Financing Review* 17(3): 191–204.

Gianfrancesco, F. D., A. P. Baines, and D. Richards. 1994. Utilization Effects of Prescription Drug Benefits in an Aging Population. *Health Care Financing Review* 15(3): 113–126.

Goldberg, T., C. A. Devito, D. Smith, et al. 1979. Evaluation of Economic Effects of Drug Product Selection Legislation. *Medical Care* 17(4):411–419.

Greenlick, M. R., and B. J. Darsky. 1968. A Comparison of General Drug Utilization in a Metropolitan Community with Utilization Under a Drug Prepayment Plan. *American Journal of Public Health* 58(11): 2121–2136.

Hadley, J., E. P. Steinberg, and J. Feder. 1991. Comparison of Uninsured and Privately Insured Hospital Patients. Condition on Admission, Resource Use, and Outcome. *Journal of the American Medical Association* 265(3):374–379.

Hargis, J. R., ed. 1994. *Lilly Digest*. Indianapolis, Ind.: Eli Lilly and Company.

Harris, B. L., A. S. Stergachis, and L. D. Reid. 1990. The Effect of Drug Co-payments on Utilization and Cost of Pharmaceuticals in a Health Maintenance Organization. *Medical Care* 28(10):907–917.

Hays, W. L. 1988. *Statistics*. 4th ed. Chicago: Holt, Rinehart and Winston, Inc.

Holcombe, R. F., and J. Griffin. 1993. Effect of Insurance Status on Pain Medication Prescriptions in a Hematology/Oncology Practice. *Southern Medical Journal* 86(20):151–156.

Hornbrook, M. C. 1976. *Market Domination and Promotional Intensity in the Wholesale-Retail Sector of the U.S. Pharmaceutical Industry*. Technical Paper No. 5. National Center for Health Services Research.

Jambulingam, T., and D. H. Kreling. 1995. Relationship Between the Number of Firms and Generic Price Competition. *Journal of Research in Pharmaceutical Economics* 6(3):39–60.

Kaine, R. F., and E. J. O'Connell. 1972. Physicians' Appreciation of Drug Charges to the Patient. *Clinical Pediatrics* 11(2):665–666.

Keppel, G. 1982. *Design and Analysis: A Researcher's Handbook*. 2nd ed. Englewood Cliffs, N.J.: Prentice Hall.

Knowlton, C. H., and D. A. Knapp. 1994. Community Pharmacists Help HMO Cut Drug Costs. *American Pharmacy* NS34(1):36–42.

Kolassa, E. M. 1995. Physicians' Perceptions of Prescription Drug Prices: Their Accuracy and Effect on the Prescribing Decision. *Journal of Research in Pharmaceutical Economics* 6(1):23–37.

Kotzan, J. A., and N. V. Carroll. 1991. Why Medicaid Pays More: A Comparison of Private Payment and Medicaid Prescription Prices, Quantities, Product Mix, and Dosage Forms. *Journal of Research in Pharmaceutical Economics* 3(2):39–56.

Kreling, D. H., and E. K. Paulsen. 1989. Medicare Supplement Insurance: A Primer for Pharmacists. *Wisconsin Pharmacist* 58(3):15–17.

Kreling, D. H., and R. E. Mucha. 1992. Drug Product Management in Health Maintenance Organizations. *American Journal of Hospital Pharmacy* 49:374–381.

Lavers, R. J. 1989. Prescription Charges, the Demand for Prescriptions and Morbidity. *Applied Economics* 21: 1043–1052.

Leibowitz, A., W. G. Manning, and J. P. Newhouse. 1985. The Demand for Prescription Drugs as a Function of Cost Sharing. *Social Science and Medicine* 21(10): 1063–1069.

Levit, K. R., A. L. Sensenig, C. A. Cowan, et al. 1996. National Health Expenditures, 1994. *Health Care Financing Review* 17(3):205–242.

Lowy, D. R., L. Lowy, and R. S. Warner. 1972. A Survey of Physicians' Awareness of Drug Costs. *Journal of Medical Education* 47(May):349–351.

Lurie, N., N. B. Ward, M. F. Shapiro, et al. 1984. Termination from Medi-Cal—Does it Affect Health? *New England Journal of Medicine* 311(7):480–484.

———. 1986. Termination of Medi-Cal Benefits. A Follow-up Study One Year Later. *New England Journal of Medicine* 314(19):1266–1268.

Martin, J. P., and S. Williams. 1959. The Effects of Imposing Prescription Charges. *The Lancet* (January):36–39.

Medical Economics Company. 1993. *Red Book 1993–94*. Montvale, N.J.: Medical Economics Company, Inc.

Mirer, T. M. 1988. *Economic Statistics and Econometrics*. New York: Macmillan.

Mort, E. A., J. N. Edwards, D. W. Emmons, et al. 1996. Physician Response to Patient Insurance Status in Ambulatory Care Clinical Decision Making: Implications for Quality of Care. *Medical Care* 34(8):783–797.

Mott, D. A., and D. H. Kreling. 1997. The Influence of Therapeutic Category and Insurance Type on Generic Substitution of Drug Products. *Journal of Research in Pharmaceutical Economics* 8(3):3–22.

Nagurney, J. T., R. L. Braham, and G. G. Reader. 1979. Physician Awareness of Economic Factors in Clinical Decision Making. *Medical Care* 17(7):727–736.

Nelson, A. A., C. E. Reeder, and W. M. Dickson. 1984. The Effect of Medicaid Drug Copayment on the Utilization and Cost of Prescription Services. *Medical Care* 22(8): 724–736.

Newhouse, J. P. 1978. The Structure of Health Insurance and the Erosion of Competition in the Medical Marketplace. In *Competition in the Health Care Sector: Past, Present and Future*. W. Greenberg, ed. Washington, D.C.: Federal Trade Commission.

———. 1993. *Free for All? Lessons from the RAND Health Insurance Experiment*. Cambridge, Mass.: Harvard University Press.

Oppenheim, G. L., S. H. Erickson, and C. Ashworth. 1981. The Family Physician's Knowledge of the Cost of Prescribed Drugs. *The Journal of Family Practice* 12(6): 1027–1030.

Pauly, M. V. 1980. *Doctors and their Workshops*. Chicago: Chicago University Press.

Pongcharoensuk, P. 1989. Market Position and Pricing Strategies of Manufacturers of Patent Drug Products When Facing Competition from Generic Drug Products. Doctoral dissertation. University of Texas, Austin.

Raynes, N. 1979. Factors Affecting the Prescribing of Psychotropic Drugs in General Practice Consultation. *Psychology and Medicine* 9:671–679.

Roth, R. B. 1973. How Well Do You Spend Your Patients' Dollars? *Prism* (September):16–17,49.

Schondelmeyer, S. W., and J. A. Johnson. 1994. *American Druggists' 1994 Prescription Trends Survey*. Minneapolis, Minn.: The PRIME Institute.

Schwartz, R. K., S. B. Soumerai, and J. Avorn. 1989. Physician Motivations for Nonscientific Drug Prescribing. *Social Science and Medicine* 28(6):577–582.

Shepherd, M. D., P. Pongcharoensuk, and D. H. Kreling. 1986. An Examination of Drug Product Selection in Texas Two Years After Enactment of Legislation. *Journal of Pharmaceutical Marketing and Management* 1(2):97–108.

Sleath, B. 1993. Patient Gender and Psychotropic Prescribing During the Physician-Patient Interaction. Doctoral dissertation. University of Wisconsin-Madison.

Sloan, F. S., J. Valvona, and R. Mullner. 1986. Identifying the Issues: A Statistical Profile. In *Uncompensated Hospital Care: Rights and Responsibilities*. F. S. Sloan, J. Blumstein, J. Perrin, eds. Baltimore, Md.: Johns Hopkins University Press.

Smith, D. G., and D. M. Kirking. 1992. Impact of Consumer Fees on Drug Utilization. *PharmacoEconomics* 2(4): 335–342.

Smith, D. G. 1993. The Effects of Copayments and Generic Substitution on the Use and Costs of Prescription Drugs. *Inquiry* 30:189–198.

Smith, M. C., and D. D. Garner. 1974. Effects of a Medicaid Program on Prescription Drug Availability and Acquisition. *Medical Care* 12(7):571–581.

Sonnefeld, S. T., D. R. Waldo, J. A. Lemieux, et al. 1991. Projections of National Health Expenditures

Through the Year 2000. *Health Care Financing Review* 13:1–15.

Soumerai, S. B., T. L. McLaughlin, D. Ross-Degnan, et al. 1994. Effects of Limiting Medicaid Drug Reimbursement Benefits on the Use of Psychotropic Agents and Acute Mental Health Services by Patients with Schizophrenia. *New England Journal of Medicine* 331(10): 650–655.

Soumerai, S. B., D. Ross-Degnan, J. Avorn, et al. 1991. Effects of Medicaid Drug-Payment Limits on Admission to Hospitals and Nursing Homes. *New England Journal of Medicine* 325(15):1072–1077.

Stateman, M., and T. T. Tyebjee. 1981. Trademarks, Patents, and Innovation in the Ethical Drug Industry. *Journal of Marketing* 45(Summer):71–81.

Stergachis, A. S., M. Fors, E. Wagner, et al. 1987. Effect of Clinical Pharmacists on Drug Prescribing in a Primary Care Clinic. *American Journal of Hospital Pharmacy* 44:525–529.

Stewart, J. E., P. G. Grussing, and A. A. Purohit. 1982. Drug Product Selection in Illinois: The First Year's Experience. *Medical Care* 20(8):831–842.

Stuart, B., F. Ahern, V. Rabatin, et al. 1991. Patterns of Outpatient Prescription Drug Use Among Pennsylvania Elderly. *Health Care Financing Review* 12(3):61–72.

Temin, P. 1991. Physician Prescribing Behavior: Is there Learning by Doing? In *Drugs and Health*, R. B. Helms, ed. Washington, D.C.: American Enterprise Institute for Public Policy Research.

Vernon, J. M. 1971. Concentration, Promotion, and Market Share Stability in the Pharmaceutical Industry. *Journal of Industrial Economics* 19:246–266.

Vuturo, G. J., J. P. Krisher, and W. C. McCormick. 1980. Drug Product Selection: The Florida Experience. *American Journal of Public Health* 70:479–482.

Weeks, H. A. 1973. Changes in Prescription Drug Utilization After the Introduction of a Prepaid Drug Insurance Program. *Journal of the American Pharmaceutical Association* NS13(4):205–209.

Yeasalis, C. E., G. J. Norwood, D. Lipson, et al. 1980. Capitation Payment for Pharmacy Services: Impact on Generic Substitution. *Medical Care* 18(8):816–828.